CLAIMS

What is claimed is:

1. A breast scanning apparatus, comprising:

an ultrasound transducer having a scanning surface;

a first compressive member comprising an at least partially conformable membrane in a substantially taut state, said membrane having a first surface for contacting a breast and a second surface opposite said first surface;

a second compressive member, wherein at least one of said first and second compressive members is movable relative to the other to allow placement and compression of the breast between the first and second compression members;

a transducer translation mechanism configured to hold the scanning surface of the ultrasound transducer against said second surface of said membrane while translating the ultrasound transducer thereacross to scan the breast; and

an irrigation system automatically maintaining a continuous supply of coupling agent at an interface between said scanning surface and said second surface of said membrane as said ultrasound transducer is translated thereacross.

2. The breast scanning apparatus of claim 1, said coupling agent comprising a substantially nonviscous liquid, said breast scanning apparatus further comprising a coupling agent recycling system that collects coupling agent departing said interface and returns the coupling agent to said irrigation system for reapplication to said interface.

3. The breast scanning apparatus of claim 2, said first and second compressive members being rotatable around an anterior-posterior axis of a patient for facilitating breast scans at different scan angles including a CC angle, an MLO angle, and an ML angle, wherein said coupling agent recycling system is configured to collect and return said leaving coupling agent to said irrigation system at any of said different scan angles.

4. The breast scanning apparatus of claim 3, further comprising a frame sealably enclosing said ultrasound transducer in cooperation with said membrane for preventing loss of said nonviscous liquid coupling agent.

5. The breast scanning apparatus of claim 4, wherein said nonviscous liquid coupling agent consists primarily of water.

6. The breast scanning apparatus of claim 2, wherein said ultrasound transducer is a linear array transducer.

7. The breast scanning apparatus of claim 6, said irrigation system comprising a distribution tube positioned adjacent to said ultrasound transducer along a length thereof, said distribution tube having openings therealong emitting said coupling agent, wherein a leaking reservoir abutting said interface is established in an elongate gap bounded by said distribution tube, said ultrasound transducer, and said membrane.

8. The breast scanning apparatus of claim 1, wherein said scanning surface comprises a material substantially acoustically matched to said membrane.

9. The breast scanning apparatus of claim 8, wherein said scanning surface comprises a thermoplastic polyetherimide material, and wherein said membrane comprises a biaxially oriented polyester film.

10. The breast scanning apparatus of claim 1, said second compressive member comprising a substantially rigid plate that applies most of a total compression weight to the breast, said second compressive member further comprising and an inflatable bladder that applies a remainder of the total compression weight to the breast in a peripheral area near a skinline of the compressed breast.

11. A method for ultrasonically scanning a breast being compressed by a thin compressive member having a first side and a second side, a first side of said compressive member contacting the breast, comprising:

maintaining a surface of a transducer in contact with the second side of the compressive member while translating the transducer thereacross under motor control to scan the breast; and

automatically irrigating an interface between said transducer surface and the second side of the compressive member in a manner that maintains a continuous supply of coupling agent at said interface.

12. The method of claim 11, said coupling agent comprising a substantially nonviscous liquid that generally departs said interface as said transducer is translated, further comprising automatically recycling said coupling agent and reapplying the recycled coupling agent to said interface.

13. The method of claim 12, further comprising heating said coupling agent to approximately body temperature to facilitate comfort of a patient.

14. The method of claim 12, further comprising filtering said recycled coupling agent prior to said reapplying to said interface.

15. The method of claim 12, said transducer being a linear array transducer, wherein said irrigating comprises maintaining a dynamic reservoir in a gap formed between said transducer, said second surface, and an elongate distribution tube positioned along a length of said transducer near said interface.

16. In a full-field breast ultrasound (FFBU) scanning unit having a first compressive member, the FFBU scanning unit compressing a breast against a first surface of the first compressive member while translating a linear transducer along a second surface thereof opposite the first surface, the linear transducer comprising elements extending in an axial direction and being translated in a lateral direction generally perpendicular to said axial direction, a method for breast scanning, comprising:

performing a full-resolution imaging sweep capturing full-resolution ultrasound frames of the compressed breast at closely-spaced transducer locations corresponding to a nominal lateral image volume resolution;

prior to said full-resolution imaging sweep, performing a survey sweep capturing lower-resolution ultrasound frames at more coarsely-spaced transducer locations;

processing said lower-resolution ultrasound frames to determine a lateral extent of the compressed breast; and

during said full-resolution imaging sweep, skipping over lateral regions of said second surface corresponding to areas outside the lateral extent of the breast, thereby reducing a completion time of said full-resolution imaging sweep.

17. The method of claim 16, further comprising:

processing said lower-resolution ultrasound frames to determine an axial extent of the compressed breast; and

during said full-resolution imaging sweep, deactivating those transducer elements corresponding to axial areas outside the axial extent of the breast, thereby further reducing said completion time.

18. The method of claim 17, said FFBU scanning unit comprising a second compressive member compressing the breast against the first compressive member, said first and second compressive members being separated by a first distance corresponding to a compressed breast thickness, said FFBU scanning unit only processing acoustic interrogation signals for image locations within said first distance from the ultrasound transducer, thereby further reducing said completion time

19. The method of claim 18, wherein said lower-resolution frames are further processed to establish ultrasound acquisition parameters optimizing image quality of said full-resolution frames acquired during said full-resolution imaging sweep.

20. The method of claim 19, wherein said first compressive member comprises a substantially non-stretchable film sheet in a substantially taut state.